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Social annotation: what are students' perceptions and how does social annotation relate to grades?

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Social annotation is a teaching and learning technique in which students post comments on electronic course materials in a shared space. The purpose of this study is to examine students' perceptions of social annotation in the context of motivation and social justice. In addition, the connections between social annotation and course grades were examined. Students in a face-to-face course engaged in social annotation on their course textbook and completed a questionnaire on their perceptions ($N = 41$). Based on the findings, students had higher overall motivation for social annotation compared with quizzes. In contrast, comparisons of motivation between social annotation and individual notetaking were mixed depending on the motivational construct. Students reported average higher-than-average opportunities for representational justice with social annotation (i.e. opportunities to share experiences and speak from their identities). Regarding grades, multiple social annotation constructs were positively associated with course grades. However, only active reading time appeared to be uniquely predictive of course grades. These findings suggest that social annotations promote active reading, which may encourage better understanding of the course content. Importantly, these findings indicate that students are motivated to engage in social annotation.

Keywords: social annotation; collaborative annotation; college students; motivation; representational justice

Social annotation, also referred to as collaborative annotation, involves students sharing their comments and highlights on an electronic document with their peers (Murphy Contributor, 2021). Social annotation has been shown to promote engagement and peer interaction in online courses (Kalir, 2020; Lazzara & Clinton-Lisell, 2022; Zhu et al., 2020), but more needs to be known about its role in face-to-face instruction. Furthermore, much of social annotation research has lacked a theoretical lens (Sun et al., 2023). Grounding research in social annotation in established theory would foster connections with previous findings. Moreover, reading from electronic textbooks is becoming more commonplace although reading comprehension is generally better from paper (Clinton, 2019; Delgado et al., 2018; Kong et al., 2018). However, studies finding an advantage of paper over screen for reading comprehension typically do

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not incorporate the affordances of screens, such as social annotations (Clinton-Lisell et al., 2023). Therefore, it is essential to examine methods of leveraging the advantages of reading from screens using electronic tools to best support student comprehension (Ross et al., 2017). The purpose of this study is to examine student perceived motivation and social justice for using social annotation in a face-to-face course. The self-determination theory of motivation (Deci & Ryan, 2000) and social justice principle of representational justice (Fraser, 2008) are incorporated to ground this study.

Social annotation allows students to interact on a shared document. Unlike traditional, individual notetaking, social annotation allows students' peers to see their comments on the readings. In this way, social annotation promotes peer-to-peer interactions as well as interactions with the text (Adams & Wilson, 2020). Social annotation is often used as a method to foster community, which is often the motivation for its use in online courses. Social annotation is a method to promote engagement with course readings, such as preparing for face-to-face classes (Miller et al., 2018). Students generally do not complete assigned readings before class unless there are accountability measures, such as quizzes or reflection assignments (Bassett et al., 2020; Heiner et al., 2014; Kolpikova et al., 2019). However, being prepared for class may improve learning course content (Bassett et al., 2020,); therefore, it follows that social annotation could foster student learning. This could explain why students who were required to complete social annotations for preclass reading assignments had higher exam performance than their peers without such a requirement (Miller et al., 2018). However, it is unclear if the annotations themselves or the promotion of active reading through the annotations were responsible for the learning benefits (Miller et al., 2018). A secondary purpose of this study is to examine how social annotations metrics, such as the number of annotations and reading time, as well as students' perceptions of social annotations, relate to course performance.

Theoretical frameworks

Overall, examinations of students' perceptions of social annotations have indicated positive attitudes (e.g. Kalir et al., 2020; Lazzara & Clinton-Lisell, 2022). For example, students who engaged in social annotation reported higher levels of positive emotions (e.g. excited, happy) and lower levels of negative emotions (e.g. worried, distressed) than their peers who read the texts individually from paper (Razon et al., 2012). According to interviews of students, social annotation supports collaboration and shared meaning-making in the course (Kalir, 2020). However, these studies have typically needed more theoretical grounding and examined social annotation in isolation (e.g. not comparing to another task; Sun et al., 2023). The theoretical frameworks of self-determination theory and the social justice principle of representational justice were used in this study to build on prior work on social annotation.

Social annotation may prompt higher levels of motivation than quizzes or individual notetaking based on self-determination theory. Self-determination theory is a well-established understanding of human motivation. According to self-determination theory, humans have basic psychological needs of competence, autonomy, and relatedness (Ryan & Deci, 2000). Competence is the perception that one is adequately skilled for a task and able to successfully meet the task goals (Deci et al., 1981). Competence for social annotation is anticipated to be strong, given that the platform is considered user friendly (Har & Ho, 2023). Autonomy is the experience of having

options and freedom from external pressure (Deci & Ryan, 2012). Because social annotation allows for choice in terms of what and how to comment on the reading, it is anticipated that autonomy will be higher for social annotation than for quizzes in which students do not get to decide which questions to answer. However, because individual note taking is rarely required, it may have higher perceived autonomy than the required social annotation assignments. Relatedness, when referring to students, involves perceiving that one's peers and instructors approve of them and accept their ideas (Ryan & Niemiec, 2009). Students interact with their peers as an inherent component of social annotation, whereas quizzes and individual notetaking do not require peer interaction. Subsequently, relatedness is anticipated to be higher for social annotation.

When these needs of competence, autonomy, and relatedness for a task are met, motivation for that task is higher than when these needs are unmet (Deci & Ryan, 2012). Self-determination theory generally focuses on intrinsic motivation, in which one wishes to engage in an activity due to inherent interest or enjoyment (as opposed to extrinsic motivation, which is based on external rewards or punishments; (Ryan & Deci, 2000). Intrinsic motivation is well-known to promote student learning and success across disciplines (Howard et al., 2020). Therefore, social annotation is anticipated to yield higher levels of intrinsic motivation than quizzes or individual annotations.

In all educational research, social justice is of critical importance due to historical systems of inequity in the field (hooks, 2003; Ladson-Billings, 2004, 2014). Social justice can be defined as '… an ideal condition in which all members of a society have the same rights, protections, opportunities, obligations, and social benefits. Implicit in this concept is the notion that historical inequalities should be acknowledged and remedied through specific measures' (Barker, 2003, p. 405). Social justice is specifically relevant to social annotation as it can be a means of 'expressing power' by having a dialogue with the text (Brown & Croft, 2020). In this way, students become knowledge producers with the power to express their ideas and critiques of the text (Kalir & Dean, 2018). Digital spaces such as social annotation allow students to produce and share knowledge in manners contrary to traditional systems in which students are meant to solely consume knowledge (Lambert, 2018; Traxler, 2016). Specific to social justice frameworks, social annotation may provide opportunities for representational justice. Representational justice is intentionally having opportunities for expression by students who have been historically underserved by educational systems (Fraser, 2008; Lambert, 2018). These opportunities may be provided through democratic education practices that empower student voices in classroom activities (Rector-Aranda & Raider-Roth, 2015). Because students may share their ideas and experiences in social annotation rather than only receiving ideas from the text, social annotation may provide opportunities for representational justice. However, social annotations can also become a space for exacerbating inequities. For examples, social annotations that centre on nonminoritized identities, involve microaggressions, invalidate experiences of nondominant identities will likely yield harmful, unsafe, and inequitable outcomes for students (Brown & Croft, 2020).

The current study

Social annotation is a promising tool, but in need of more inquiry. To address this need, a study was conducted in which students in a face-to-face course were assigned social annotation of their textbook content prior to class. This allows for seeing if the positive

engagement observed with social engagement online courses would transfer to promoting better preclass reading assignments (Chen et al., 2020). Furthermore, this study builds on prior research on social annotation by examining student perceptions through theoretical lenses of motivation and social justice. Previous studies have indicated that students perceived learning benefits from reading peer annotations and that social annotation overall improves comprehension of course content (Kalir et al., 2020; Miller et al., 2018). This study would examine how social annotation metrics (e.g. number of annotations and reading time) relate to grades in the course. In this study, social annotation was compared with another method of accountability for required readings: quizzes on readings (Gyllen et al., 2021). In addition, students were asked to compare social annotation to their experiences with individual notetaking, which is a more traditional form of annotation.

Three research questions guide this study:

1. What are students' motivation levels for social annotation compared with chapter quizzes and individual notetaking?
2. What are students' perceived levels of representational justice for social annotations?
3. What are the associations with motivation for social annotation, representational justice in social annotation, social annotation metrics, and student grades?

Methods

Context

This study occurred in an undergraduate, face-to-face child development course (introductory level) with a total enrollment of 45 students at a mid-sized, predominantly white institution in the Great Plains region of the United States. The course textbook was *Child Growth and Development* (Paris et al., 2019), an open educational resource that is freely available without access fees. For the first chapter, students were required to complete a multiple-choice quiz through the course learning management system before covering the material in class. For the remaining 14 chapters, students were required to annotate the chapter using Perusall before class. Students were in groups of 5–6 students and could only see the annotations of their group members. The directions were to post six annotations on the reading with encouragement to upvote (similar to 'liking' a social media post) or reply to others' annotations. Students received full credit for completing the six annotations regardless of the content of the annotations (e.g. the Perusall automated scoring algorithm was not used). The instructor reviewed the annotations and responded to questions posed by the students.

Deidentified data (i.e. demographics were removed) and the measures used in this study are available on Open Science Framework (Clinton-Lisell, 2023).

Participants

Prior to data collection, ethics approval was received from the institution's review board. Students were invited to complete an online survey on their motivation for social annotations on the eighth week of the semester (semesters are 16 weeks long). They were given extra credit as an incentive with an option to write a short essay if

they wished to receive extra credit without participating. To encourage candour in responses, a colleague gave the course instructor and author of this study a list of students who participated and should receive extra credit, but the instructor did not view the responses until after grades were entered for the term. Forty-one students consented to participate and completed at least some sections of the survey. Based on the demographics reported in the survey, the average age was 19.05 years (SD = 1.10 years). Regarding race, the overwhelming majority of the 36 students who reported race were Caucasian (30 students), with one Hispanic, one African American, and two reporting multiracial backgrounds. In terms of gender, five reported being male (he/him pronouns), one reported being both male and gender nonconforming (he/they pronouns), and 32 reported being female (she/her pronouns). Nineteen per cent indicated that they were first-generation college students (first in their families to attend college), 12.8% indicated they received Pell Grants for financial aid, and 6.4% indicated they received accommodations for their learning due to a disability.

Measures

Motivation

Motivation was examined in the context of self-determination theory through subscales of autonomy (choice and pressure), competence, and relatedness (items from Deci et al., 1994). In addition, intrinsic motivation through inherent interest and enjoyment was also assessed (also items from Deci et al.,1994). Parallel items were developed for social annotation, quizzes on readings, and individual notetaking for each of the subscales. For each subscale, students were asked to report how true of themselves each item was on a Likert scale of 1–5, with one being not at all true and five being very true.

Representational justice

Representational justice, which in educational contexts is student opportunities to voice their experiences and speak from their identities, was measured using a self-report instrument adapted from Clinton-Lisell and Gwozdz (2023). This instrument consists of six items regarding student self-expression in social annotation in which students reported their level of agreement on a Likert scale of 1–5. Because quizzes do not have analogous self-expression opportunities and individual notetaking is not typically shared with others, only representational justice items for social annotation were developed.

Social annotation

Perusall, the social annotation tool used in this study, provides analytics on student participation and reading. For this study, the metrics used were the annotations per chapter, time spent actively reading (as opposed to only having the document open without interacting with it as indicated by some keystroke or mouse movement every 2 min) per chapter, and the average number of words in each chapter's annotations.

Course grades

Course grades were based on a case study, lesson plans, short papers and assignments, three exams, in-class assignments (participation), and completion of social annotation. For this study, points earned from social annotations were subtracted from the total course grades to examine how these annotations related to grades on other aspects of the course. Course grades were reported in terms of the percentage of possible points to allow for ease of interpretation.

Results

Descriptive statistics of study variables are provided in Tables 1 and 2. A Type I error rate of 0.05 was used throughout these analyses.

Motivation

To address the first research question, repeated measures ANOVA comparing student-perceived choice, pressure, competence, relatedness, and interest/enjoyment (dependent variables) for social annotation, quizzes, and individual note taking (independent variables) were conducted. If statistically significant, follow up comparisons to social annotation with Bonferonni corrections were reported. The within-subjects effects for choice were significant, $F(2, 37) = 38.28$, $p < 0.001$. Based on pairwise comparisons, choice for social annotation was significantly higher than choice for quizzes ($p < 0.001$), but choice for social annotation was lower than choice for individual note taking ($p < 0.001$). The within-subjects effects for

Table 1. Means and standard deviations of grades, social annotation, and representational justice variables.

	M (SD)	Observed minimum	Observed maximum
Grade (percent)	87.73 (9.77)	56.66	99.69
Active reading time (average minutes per chapter)	35.82 (23.18)	3	106
Number of annotations (average per chapter)	5.97 (2.21)	0.5	14.21
Average number of words per chapter	247.48 (105.21)	8.71	486.45
Representational justice	3.87 (0.68)	1.67	4.83

Table 2. Descriptive statistics for motivation variables by condition.

	Social annotation M (SD)	Quizzes M (SD)	Individual notetaking M (SD)
Choice	2.98 (0.72)	2.25 (0.91)	3.86 (0.98)
Pressure	2.21 (0.95)	3.51 (0.80)	2.26 (0.93)
Competence	3.45 (0.86)	2.90 (0.91)	3.40 (0.93)
Relatedness	3.32 (0.84)	2.37 (.73)	2.59 (0.63)
Interest/enjoyment	3.09 (0.84)	2.17 (0.80)	2.81 (1.03)

pressure were significant, F(2, 37) = 29.38, $p < 0.001$. Pressure for social annotations was significantly lower than pressure for quizzes with no reliable differences between social annotations and individual note taking ($p = 0.99$). The within-subjects effects for competence was significant, $F(2, 37) = 8.14$, $p < 0.001$, with social annotation competence being higher than quiz competence, $p < 0.001$, but no differences were noticed with individual note taking competence ($p = 0.99$). Within-subjects effects for relatedness were significant with social annotation relatedness being higher than relatedness with quizzes and individual note taking (both $p < 0.001$). Within-subjects effects for interest and enjoyment were significant, $F(2, 37) = 8.14$, $p < 0.001$, with social annotation being higher than quizzes ($p < 0.001$), but no reliable differences with individual note taking ($p = 0.37$).

Representational justice

The scores regarding representational justice were used to answer the research question about students' perceived levels of representational justice in social annotations. To interpret students' self-report of perceived representational justice opportunities in the social annotations, an independent *t*-test (two-sided significance testing) was conducted comparing students' reported values with the midpoint (3 as it was a 1–5 scale). According to the results of this independent *t*-test, $t(40) = 8.22$, $p < 0.001$, students reported significantly higher than midpoint levels of perceived representational justice.

Social annotation and grades

To address the third research question, a correlation matrix based on Spearman's rho was created (see Table 3). Three social annotations metrics (active reading time, number of annotations, and number of words per annotation) were positively associated with course grade. Two motivation variables for social annotation (competence and relatedness) were positively associated with course grades as well. As may be observed in the correlation matrix, some of these variables associated with grades were also associated with each other. To examine the unique contribution of these constructs with course grades, a linear regression model was estimated with course grades as the dependent variable and the five variables significantly associated with grades as the predictor variables. These predictor variables explained 38.7% of the variance in course grades (based on the R^2). As noticed in Table 4, only active reading time reliably predicted course grade when controlling for all positively associated variables.

Discussion

The purpose of this study was to examine students' perceptions of social annotation in the context of motivation and representational justice (opportunity for self-expression). Based on this study's findings, students had more motivation for social annotation than quizzes on the reading, but results comparing social annotation to individual notetaking were mixed. Students reported higher-than-average opportunities for representational justice with social annotation. When examining grades, three social annotation metrics and two motivation constructs (competence and relatedness) were positively associated with course grades. However,

Table 3. Correlation matrix of grades with social annotation variables.

	Grade	Active Reading	Number of Annotations	Average words	Interest/ Enjoy	Pressure	Choice	Competence	Relatedness	Representa- tional Justice
Active Reading	0.51**	1								
Number of Annotations	0.50**	0.47**	1							
Average words	0.32*	0.40*	0.42**	1						
Interest/Enjoy	0.18	0.24	0.29	0.42**	1					
Pressure	-0.27	-0.25	0.01	-0.11	-0.22	1				
Choice	0.01	-0.05	0.32	0.56**	0.54**	0.04	1			
Competence	0.35*	0.36*	0.16	0.25	0.59**	-0.62**	0.19	1		
Relatedness	0.38*	0.22	0.23	0.42**	0.52**	-0.40*	0.44*	0.55**	1	
Representational Justice	0.19	0.13	0.29	0.50**	0.63**	-0.32*	0.46**	0.46**	0.65**	1

Table 4. Regression analysis predicting course grades.

Predictor	Standardized Beta Coefficient	T	Significance
Constant		7.19	<0.001
Active reading	0.43	2.46	0.02
Number of annotations	0.00	0.02	0.99
Number of words	0.07	0.43	0.67
Competence for social annotation	0.16	0.95	0.35
Relatedness with social annotation	0.23	1.33	0.20

only one of the social annotation metrics, active reading time, uniquely predicted course grades.

Motivation

Self-determination theory was used as a lens to investigate motivation for social annotation. In self-determination theory, motivation is optimal when the basic needs of autonomy, competence, and relatedness are met (Ryan & Deci, 2000, 2017). In this study, autonomy was based on choice (indicating higher levels of autonomy) and pressure (indicating lower levels of autonomy; Reeve & Cheon, 2021). Students reported more autonomy regarding higher choice and less pressure with social annotations than quizzes, but less choice with social annotations compared with individual note taking. The greater autonomy with social annotations compared with quizzes could be due to social annotations allowing more freedom in interacting with the textbook compared with quizzes, which are a predetermined set of questions (Shih, 2021). However, social annotations and quizzes are both required for grades in the course used for this study, whereas individual note taking was not required. The absence of a requirement could explain why perceived choice was higher for individual note taking than social annotations and quizzes (Hartnett, 2015).

Competence is one of the basic needs in self-determination theory (Ryan & Deci, 2017). In this study's findings, students perceived that they were similarly skilled for social annotations and individual note taking. In contrast, competence for social annotations was perceived as greater than quizzes. Because both social annotations and individual notetaking involve writing comments on the reading, it follows that competence for the skills involved would be rated similarly. One potential reason for greater perceived competence with social annotation compared with quizzes is that, unlike quizzes, there are no 'wrong' answers when commenting on the textbook (Gentrup et al., 2020). Moreover, the instructor answering questions posted as social annotation may have been perceived as competence support, which may foster motivation (Kulakow, 2020). Relatedness was higher for social annotation than for quizzes or individual note taking, which is likely because social annotation is based on peer interaction, whereas quizzes and individual notetaking do not inherently involve other students (Shih, 2021). Intrinsic motivation in terms of the inherent interest and the enjoyment of the activity was also examined (Ryan & Deci, 2000). Students indicated that they found social annotation more interesting and enjoyable than quizzes, but similar levels of interest and enjoyment were noticed for social annotation and

individual note taking. These findings could be interpreted that students find commenting on the textbook interesting and enjoyable regardless of whether those comments are shared with their peers.

Perceptions of social justice were examined for two reasons. The first was due to the need to explicitly include social justice in education research to address historical inequities (hooks, 2003; Ladson-Billings, 2004, 2014). The second was to examine whether social annotations offered students a more equitable learning experience in which they were knowledge creators and sharers rather than only consumers (Brown & Croft, 2020). Specific to this study, the social justice component of representational justice was examined to see if students perceived they had opportunities to speak from their experiences and identities (Lambert, 2018). Social annotation has been proposed as a means to support representational justice in education; however, there are concerns that social annotation could become another inequitable space due to microaggressions and invalidation of student experiences (Brown & Croft, 2020). Moreover, digital spaces, such as social annotation, provide opportunities for students to express and create rather than only consume knowledge (Traxler, 2016). Based on the findings of this study, students indicated higher-than-average levels of representational justice opportunities with social annotation. Comparisons to quizzes and individual notetaking were not made given the inherent lack of opportunity for expression and voice in these typically solitary activities.

In previous work on social annotation, it was unclear whether the annotations themselves or the increased reading prompted by the social annotations promoted better learning of the course content (Miller et al., 2018). Based on correlational analyses in this study, course grades were positively associated with the number of annotations, active reading time, average word length per annotation, relatedness for social annotation, and competence for social annotation. However, when these variables were controlled for each other in a regression analysis, only active reading time significantly predicted course grades. These findings can be interpreted that the increases in active reading of the textbook may drive the benefits of social annotations on course grades. In other words, writing the annotations and experiencing positive feelings about social annotations may promote more reading of the textbook, which subsequently enhances comprehension of course content. This interpretation of the findings is supported by previous research findings indicating reading the course textbook support is positively associated with learning course content (Junco & Clem, 2015; Landrum et al., 2012).

Limitations and future directions

It is important to notice that the students in the course were generally not from groups traditionally underserved in higher education. That is, the students in this study were overwhelmingly nonminoritized, continuing-generation college students, economically disadvantaged (based on their financial aid statuses), and without learning accommodations for disabilities. Therefore, social annotation must be examined with students from backgrounds historically underserved in higher education in order to truly understand if social annotation is a safe and useful technique for providing opportunities for representational justice. Notably, the potential for the collaboration space of social annotation to be used to perpetuate dominant narratives and express microaggressions much be monitored in future work (Brown & Croft, 2020).

Moreover, the software used for social annotation in this study, Perusall, has several accessibility features (Perusall, 2023). It would be valuable to hear from students with disabilities about the usefulness of these accessibility features.

It is important to note that this study's design does not allow for causal claims to be made; these explanations are simply interpretations of the findings. Future studies with randomisation to control groups are necessary in order to determine if social annotation does indeed promote active reading of the textbook and subsequently better learning as indicated by course grades.

Conclusion

Social annotation provides a means for students to engage with the course material collaboratively. In this study, students reported higher motivation levels for social annotation than quizzes, also used as a method to encourage preclass reading. Students also reported that they had opportunities to speak from their personal experiences through social annotations. Social annotations were positively linked to course grades, possibly due to encouraging more active textbook reading. Based on these findings, social annotation is a useful technique to motivate and encourage students to engage in the course textbook.

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